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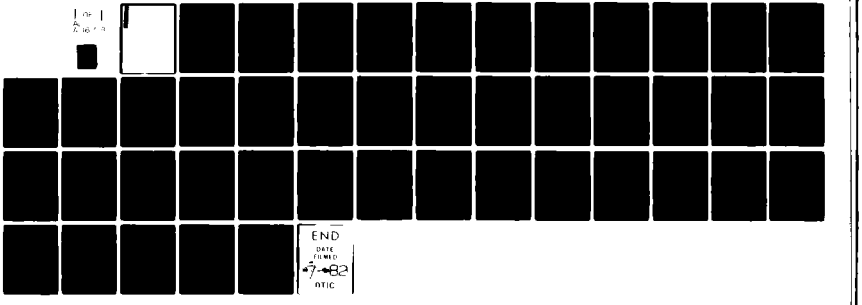

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This paper suggests the use of an on-one computer time sharing system acting in the role of a communications facility serving a community of subscribers who pose problems and tender solutions to one another anonymously. Subscribers tb the system may be categorized by professional or academic discipline. They may also be aligned through the creation of associations which the computer will recognize. Subscribers may direct their

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problems to members of select disciplines, associations or by general broadcast. The system is intended to work through the mutual cooperation of its anonymous subscribers who are encouraged to make effective contributions by the mutual benefits to be gained as well as through a status based incentive system.

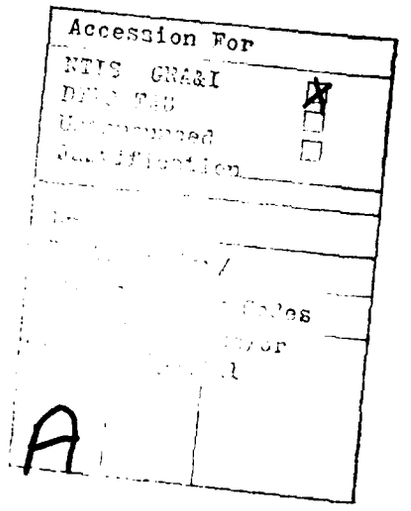
US ARMY WAR COLLEGE

INDIVIDUAL RESEARCH BASED ESSAY

MUTUAL PROBLEM SOLVING THROUGH COMPUTER TIME-SHARING

BY

ROBERT J. KNEZ, CDP



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AUTHOR: Robert J. Knez, GM-15, Defense Logistics Agency

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This paper suggests the use of an on-line computer time sharing system acting in the role of a communications facility serving a community of subscribers who pose problems and tender solutions to one another anonymously. Subscribers to the system may be categorized by professional or academic discipline. They may also be aligned through the creation of associations which the computer will recognize. Subscribers may direct their problems to members of select disciplines, associations or by general broadcast. The system is intended to work through the mutual cooperation of its anonymous subscribers who are encouraged to make effective contributions by the mutual benefits to be gained as well as through a status based incentive system.

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1. INTRODUCTION.

The United States has long been the technological leader of the world. It depends extensively upon its high technology as a military force multiplier to maintain a delicate balance of power with potentially aggressive nations. Its rapid development and implementation of high technology has also given the U.S. a competitive edge in the world economic arena. Technology transfers, both legal and clandestine, have threatened this precarious military balance and have reduced the economic lead of the U.S. in the world. Although steps are currently being taken to reduce the future outflow of technology, the only real solution to the technology loss problem is to stay a step ahead of the competition. This may be accomplished by a continuing high level of technological development. To this end, the U.S. must take full advantage of mind-extending tools at its disposal. Computer information retrieval systems have been used extensively for this purpose. These on-line information retrieval systems make abstracts of research documents and copies of the actual documents readily available to other researchers, thus reducing redundant efforts while cross-pollinating ideas between disciplines.

Little has been done, however, in the area of using a computer as an assistant or source of innovation to the researcher where documents do not yet exist. Since computers are incapable of original thought,

this is not directly possible. However, a computer may be utilized as a communications and ordering medium between practitioners of research. When this is done, the net effect is the creation of a "think tank" of a community of subscribers to the computer service, thus making yet undocumented knowledge available on a wide scale.

2. PURPOSE.

There are many famous quotations to express the thoughts that are fundamental to the purpose of this paper. Ralph Waldo Emerson's words were the most inspirational when he said "There is no limit to what can be accomplished if it doesn't mattter who gets the credit". The "not invented here" syndrome is closely related to what Emerson said. How often do we see a person or a group of individuals struggling to find a solution to a problem, only to reject a potentially viable solution which may have been voiced by an outsider? This is most likely to occur when the outsider is perceived as a competitor and therefore, as threatening. The group might not only reject the potential solution but might even go out of its way to find an alternative to the outsider's idea. In some ways, the outsider may have helped indirectly by spurring them on to work harder for the alternative answer. But, is that a rational approach to problem-solving? It's possible that the outsider's approach may be directly usable and could even be the optimum solution. What could be done to avoid this type of negative group behavior and permit a direct acceptance of ideas emanating from the outside? This paper explores the potential for the utilization of a nonthreatening, impersonal "outsider" from which to glean ideas. The paper also suggests a standard protocol and dialog that would take place between the person or group with the problem and the impersonal "outsider". To play the role

of the "outsider" we will use the most impersonal and uncaringly useful tool available: the modern computer. The methods discussed will hopefully not only make the outsider's advice acceptable but will integrate him into the group, thus making it more likely that he will offer his advice in the first place. Through the use of the computer and modern telecommunication systems we have the potential for creating an infinitely large, cohesive group for mutual problem-solving.

We must remember, however, that complex problems are not often solved by a single stroke of genius or the wave of a magic wand. The problem-resolution process must be structured such that the mind is not overwhelmed by detail. Structured computer system design or structured programming concepts provide excellent techniques for breaking problems down to a solvable size. The structured approaches first observe problems in their broadest forms and avoid the tendency to approach *entire problems at one time.* For example; if we are asked to develop a computer payroll system, we might have a tendency to begin to think about details too soon. We might begin to consider the specific formula for gross pay computations including deductions such as income tax, FICA, charity, bank deposits; exact file designs; etc. Instead, if we structure the solution from the top down, the basic problem would simply be stated as "Process Payroll." Only after that basic function is clearly stated should we begin to think of its next most simple level of detail such as Process Timecards, Retrieve Employee Data, Compute Pay and Print Checks. At this point, there is no need to concern ourselves about the data formats, the specific computations, and what the checks will look like. We might begin to think of those details in the next step which would be a further development of one of the abstractions of Process Timecards, Retrieve Employee Data, Compute Pay or Print Checks.

Thus, each newly developed refinement is a new level of abstraction for a further refinement until actual detailed statements of work result. This approach is also known as "Top Down Design" or "Top Down Refinement." Approaches such as this will still be required on an automated problem-solving system.

3. DISCUSSION.

3.1 Consulting and Brainstorming Techniques.

Will Rogers once said that "Everybody is ignorant, only on different subjects". While I agree with the words of Mr. Rogers, it is also possible that even though one may not be trained in a particular discipline, he may have thoughts or ideas of use to practitioners of that discipline. Thus, during a problem-solving process when one is looking for ideas and solutions, he may often find workable innovations through consulting with others. What must be developed is a convenient and economical device to enable the person with the problem to make contact with these consultants. A computer time-sharing environment with a large number of professional subscribers is an ideal way for the parties to make contact. The computer will permit economical and frequent contact to take place while preserving anonymity, if desired.

3.1.1 Some methods with computer potential.

Numerous automated information services already exist to provide an inquirer with direct information or bibliographic references based on submitted keywords, subjects, etc. Although this is a form of consultation, it is not the method discussed in this paper. To be sure however, the methods discussed in this paper would best be implemented on such an existing information service, so that a subscriber could readily switch from one to the other as he sees fit. Several methods that could be

considered for automation are identified and discussed in the next several paragraphs.

3.1.1.1 The Crawford Slip Method.

The Crawford Slip Method, which I first heard about in a speech given by Dr. John Demidovich of the Air Force Institute of Technology, was developed by C.C. Crawford in 1925. This method provides the fundamental basis for the computerized version proposed in this paper. The Crawford Method places 3" X 5" slips of paper into the hands of an audience. The slips of paper are used to provide ideas on a precisely targeted problem. The effect is the capturing of unrecorded know-how from people's brains. The anonymity of their responses relieves inhibitions and often results in the generation of innovative ideas. Crawford used this know-how and idea collection to develop textbooks, training materials, and management plans. Crawford identified the "psychological objectives" to be gained by the combining of brainpower as:

— Bolstering Courage - In a big organization fear of criticism or reprisal can stop most inputs toward big problems. Fear of failure is equally powerful. Most big problems involve others so that nobody can do much about them by working alone for a change. Status quo is the natural result without better ways to get more input from more people.

— Subdividing - a battleship or a bomber or a plane or project cannot be built as "one big lump". It is made by assembling parts. We need better ways to break down the "big lump" into manageable pieces.

— Getting raw material for thought - What others know can be good thought-starters for you. Thinking in an information vacuum or planning from blank paper is slow. Slips help to prime the pump.

— Adding fractions of know-how - Nobody knows it all. Each brain holds a fraction. Oral discussion is not good enough to put it all together. Slips help add the fractions.

— Structuring the composite - Ideas do not come to mind in neat outlines. Each ones structure is different, and like-

ly to be incomplete. The looseleaf method aids classifying all into a consistent configuration.

— Diagnosing problem situations - Reports of "Where it hurts" aid medical diagnosis. Slips let more persons help identify trouble spots in an activity. Remedial suggestions aid both diagnosis and treatment.

— Building consensus toward remedies - Writing suggestions can condition the writers for implementing them. Feedback of the composite of the suggestions causes convergence and consensus for the best.

— Forcasting acceptance of remedies - Slips serve an opinion poll function in assessing attitudes, polarizations, and potential conflicts. They aid the "Art of the possible" in handling delicate relationships.

— Improving Implementation - Comprehensive inputs lead to sounder plans, procedures or systems. Troubles identified and remedies considered give trainers, supervisors, and managers essential insights for directing the total performance and productivity.(4)

Research revealed no direct computerized implementations of the Crawford Slip Method. However, because of its simplicity in concept it may very well be looked upon as a subset of more complicated procedures such as the Delphi Method and other methods described later.

3.1.1.2 Ordering of Lists.

One of the most significant tasks facing a project planner is the optimum ordering of the various activities required to carry a project to completion. Activity lists on large projects might consist of hundreds of events. The project planner often lives with the fear that an important event may not have been recognized and thus be missing from the list. Omissions of this kind may cause severe project slippages when it is eventually discovered that an unforeseen activity must take place. For these reasons the project planner may want to verify the ordering of execution and the completeness of his activity list before projecting a completion date or cost-estimating the project. A community of subscribers in a computer network could be requested to

perform these verifications. A multidiscipline subscriber network may very well recognize related activities of which the project planner had not conceived.

3.1.1.3 The Delphi Method.

The Delphi Method is a technique designed to elicit opinions from a selected group of experts. The end product sought is a group response to a set of questions. "It attempts to improve the panel or committee approach by subjecting the views of individual experts to each others criticism in ways that avoid face-to-face confrontation and provide anonymity of opinion and of arguments advanced in defense of those opinions.(1)". After selection of a panel of experts, the questions are posed as a series of sets. After responses to a set are made, the panel members are asked to review their responses in relation to other respondent's answers. In the next round they would be asked to reconsider their response in light of their review of the others. They would also be asked to give the reasons for the estimate and to state what factors were considered. They might also be asked to describe the rationale that led them to revise their first response if they had revised it.

Statistical feedback showing the range of responses as well as critiques of each other's responses are made available to all panel members through successive rounds until finally a median response is taken to represent the group answer.

The Delphi Method appears to be the favorite among computer-implemented brainstorming techniques. The Rand Corporation had begun small Delphi experiments through a number of personal electric typewriter consoles connected through an on-line time-sharing computer system as far back as 1968, and the U.S. Army War College was using the Delphi

method in an off-line batch mode in 1976.

3.1.1.4 The Panel Consensus Technique.

Charles W. Taylor in his Panel Consensus Technique considers that decision makers generally select the best possible solution to a problem from two or more solutions that have been recommended. However, the sources of potentially good ideas are not always used because of "ignorance of their availability, organizational restraints inhibiting idea production, or timidity of the source about submitting its ideas, and the absence of a way to process a large number of ideas. (2)". "The Panel Consensus Technique was designed in the spring of 1970, by the author for the Strategic Studies Institute (SSI), an activity of the U.S. Army Combat Developments Command. The Commanding General of the USACDC requested that SSI provide the "five best ideas to improve Army Combat capability in 1976-82". Using the Panel Consensus Technique, the Institute obtained more than 250 ideas from students of the colocated U.S. Army War College, screened them, selected the five best, and sent them to the Commanding General of CDC within a week(2)".

Mr. Taylor created the concept of an "Idea Funnel" (see figure 4) to describe the technique. "A structured method by which many or few ideas can be processed by successive objective comparison, analysis, evaluation, and judgement; the aim is to achieve consensus in selecting ideas that show the most potential for solving a specific problem or problems (2)".

A panel of experts is selected to review and weigh responses with increasing criticalness as they reach higher levels in the process. The entire process is completed in five-steps; ideate, screen, select, refine, and decide resulting in a solution that is considered the most feasible, practical and implementable.

Computer aids have been utilized in the SSI's implementation of the Panel Consensus Technique although an on-line implementation has not yet been attempted.

3.1.1.5 Conferences.

One of the most utilized techniques for conferring or consultation is the conference where representatives of related organizations or groups meet to discuss common problems and other serious matters. Conferences are usually well organized and usually require invitations and registration of the attendees. Most often the conferences involve personal contact at an agreed upon meeting place, but may also be handled through simple telephone conference calls where small numbers of people are involved and face-to-face contact is unnecessary.

Video teleconferencing has recently begun in earnest. One example of this new trend has been the Holiday Inn Video Network which is currently available in 40 states and over 125 cities in the United States. The system which is called HI-NET allows:

- Simultaneous meetings to be held throughout the country with a presentation emanating from a single broadcast source.
- Two-way question and answering to take place in real-time across the network.

With such systems, conferences may be held much more often because of elimination of costs related to travel and lodging. Little is lost in communication value since the interface is provided in a real-time face-to-face mode.

Computer teleconferencing has also recently become available. This method involves the use of computer terminals by each of the participants in the conference and would normally be done in a real-time mode.

Implementations of computer teleconferencing systems may provide means of announcing the upcoming conference, creating pre and post registration notices, creating participants lists, developing agendas, etc. One such implementation is "CONFER II" which is available through Advertel Communications Systems, Inc. of Ann Arbor Michigan. This system is currently being utilized by the Delta Force located at the U.S. Army War College at Carlisle Barracks, Pennsylvania. The Delta Force is a voluntary group of American soldiers and citizens who essentially operate as a think-tank generating ideas and concepts for improving the U.S. Army. The Carlisle Barracks nucleus manages the operation and acts as a clearinghouse for the many ideas emanating from the group.

3.1.2 The Computer Implementation.

In order to exchange information and to brainstorm, people must be put in contact with one another. The current popular methods of making contact, such as conventions, seminars, and symposiums, meet but a few times a year, usually attract attendees of a single discipline, are expensive, and do not provide anonymity.

Previous computer implementations of think-tank and brainstorming systems have usually been relegated to small groups of professionals working on pre-specified and usually rather esoteric problems. The general community of managers and workers in both government and industry generally does not have such facilities at its disposal. The Delta Force of the U.S. Army has been very successful in its mission of gathering ideas for improving the Army. Similar concepts could be implemented for much larger memberships. This paper suggests the implementation of a time-shared system that would be commonly available

to Department of Defense managers and employees for day to day use in helping to find problem solutions. However, there is no practical limitation concerning the type of users who might find value in such a system. Users could come from all walks of life and consist of military personnel of all services, civilians of various agencies, planners, trainers, scientists, managers, researchers, etc. Irrespective of its user makeup, the system must have convenience of use. It must be readily available at the user's fingertips and be human engineered for ease of use.

3.1.2.1 Historical Perspective on Computer Usage.

Early commercial computer systems and practitioners of computer science were commonly held in awe by the general public who knew very little about them. The early systems were generically referred to as UNIVACs by many people even though the computer may have been an IBM or a Burroughs Corporation product, whereas UNIVAC (Universal Automatic Computer) was the name used by Remington Rand Corporation for their computer product. All of the early systems had one thing in common, their high cost. Indeed, the systems virtually cost millions of dollars, could run only one program at a time, and required frequent maintenance. The high cost, primarily that of the central processor and main memory, forced centralization of the systems so that the Data Processing organization could attempt to utilize them to as high a degree as possible. It was unheard of to allow computer components outside of the main computer room. They simply cost too much to entrust to anyone but the professionals.

As time went on the computer manufacturers devised new techniques to maximize the utilization of the Central Processor and memory by introducing multiprogramming (the concurrent execution of more than one

computer program on a single processor). Multiprogramming was made possible through the invention of the automatic program interrupt feature which could interrupt the program in process at the completion of an input operation between the computer and its peripherals such as tape and disk units. This interruption, which turned control over to a special program called an Operating System or Executive, allowed task switching to be made between problem programs in order to take advantage of the time that the expensive processor would have spent waiting for a relatively slow Input/Output operation to complete. Thus, through a concurrently executing mix of programs, higher utilization of the processor and memory was made possible. Later, multiprocessing (the simultaneous execution of more than one computer program on multiple processors) was introduced, and the mix of programs sharing the main systems memory and peripherals could be even greater. As time went on the cost per unit of processing decreased enormously because of the higher utilization of these expensive components. In the meantime the cost of the components was dropping at an even greater rate to the point that the emphasis on high utilization no longer seemed important at all. This lowering of component cost was due primarily to Large Scale Integration (LSI) technology. The early computer systems were so large that some actually had doors which allowed computer engineers to walk inside of the Central Processor to perform maintenance operations. The UNIVAC I and UNIVAC II were two such systems. LSI, which allowed the miniturization and integration of previously large discreet components into very small integrated packages, has completely changed this picture. Now available are semi-conductor processor chips with at least the power of the early computer systems, whose size measures about one by three

inches and costs less than ten dollars. Memory chips are available that contain more memory in their 1x3" package than some of the early systems had in a walk-in cabinet.

The net result of these advances has been the public debut of computing power. No longer is it necessary to worry about high utilization to justify high cost items. It is now an economic waste to expend expensive human resources on over-optimizing the utilization of the relatively inexpensive hardware resources. Small terminals and microcomputers may now be considered in the same way as a typewriter or a telephone whose utilization, if not constant, is not a source of great concern. There is no reason why in the next few years that computer terminals should not be as common as telephones and typewriters. All that remains is for the public to lose its early fear of computers and terminals and accept them as standard tools for computing, storing information and above all, communicating with each other.

3.1.2.2 Current Computer Usage and Potential.

Because of the rapid advances in computer and data communications technology in recent years many new applications have become economically feasible. Low-priced computer terminals, microcomputers, modems (Modulator/Demodulators) and time-shared computer systems are the mix of components necessary for large scale implementations of computer "think-tank" or "brain-storming" networks. Excellent terminals and microcomputers that may be utilized as terminals are available for under $700.00, modems for under $200.00 and commercial time-sharing facilities for as little as $5.00 per connect hour, such as the Compuserve Micronet system located in Columbus, Ohio. This system is accessible through most major U.S. cities via a local telephone call.

The U.S. Government operates a number of time-sharing computer systems that have potential for use as a brainstorming system for U.S. Government personnel. One such system is operated by the Defense Technical Information Center (DTIC) located at Cameron Station in Alexandria, Va. "The Defense Technical Information Center (DTIC) is the clearinghouse for the Defense Department's collections of research and development in virtually all fields of science and technology, involving subject categories ranging from aeronautics to zoology". (3) DTIC maintains four data bases:

- R&D Program Planning Data Base - which contains program planning documentation at the project and task level.
- R&T Work Unit Information System Data Base - which contains summaries of current research and technology projects.
- Technical Report Bibliographic Data Base - which contains bibliographic citations to documented results of defense sponsored research, development, test, and evaluations.
- Independent Research and Development Data Base - which contains descriptions of technical programs currently being performed by DOD contractors. Information in this data base is considered proprietary to the contractor, and is therefore available only to defense employees.

DTIC utilizes UNIVAC 1100/82 dual processor and UNIVAC 1108 single processor computer systems to maintain these data bases and their accessing programs. DTIC's users include U.S. Government R & D activities, government contractors, sub-contractors, and grantees. Since data stored within the system is classified as high as secret, there would be some obvious restrictions on opening up the data bases to a wider audience, but concurrent implementation of a Consultants Anonymous system on the same hardware could be accomplished with software fences. Only DTIC could properly evaluate the risk of doing this.

3.1.2.3 Consultants Anonymous.

Consultants Anonymous is the name used throughout the rest of this paper to identify a strawman for a potential mutual problem solving computer time-sharing system. Consultants Anonymous would be best implemented on an existing time-shared computer system such as DTIC's, CONFER II, or through other commercially available systems that could provide adequate security. However implemented, Consultants Anonymous should be thought of as only one of the services available on the system. For example: it would be considered as an additional concurrent service to an existing information retrieval, electronic mail, word processing, bulletin board, computer conferencing, or other office automation service. The scope of this paper does not allow for a complete description of these other potential services but instead concentrates on implementation of several consulting techniques like the Crawford Slip Method and Ordering of lists. These two methods generally provide the fundamental basis for exercising more involved brain-storming procedures such as the Delphi Method or The Panel Consensus Technique. The Crawford Slip Method, even in its simplest form, provides a means of accessing undocumented knowledge that cannot be retrieved through conventional information retrieval systems.

The refreshing simplicity of the Crawford Slip Method makes it an ideal choice for automation. The infinite variety of potential problem or target statements that could be posed might include submittals such as:

- o What is the greatest security threat facing the U.S. in Asia today?
  - oo Addressed to military and political officials.

- o What can be done to assure that the Merit Pay performance standards are established in a consistent manner across agencies?
  - oo Addressed to civil service managers.

- o I am having difficulty in getting release 36 of Corporation Y's operating system to work. It will not allocate disk space properly on model Z disk drives. Has anyone else had a similar problem with this release?
  - oo Addressed to an association of computer users.

- o I am developing a PERT network for the design, development, and implementation of a new manufacturing process for widgets. Please recommend proper sequencing and identify any missing critical events from the following list: (Event) list would follow).
  - oo Addressed to manufacturers and managers.

- o Do you feel that Supply Side economics is the answer to our current economic problems?
  - oo Broadcast to all on the network.

- o What can be done to limit the non-mission essential tasks that inhibit the combat readiness of the Army?
  - oo Addressed to members of the armed services.

- o What can be done to improve the morale of enlisted men in the U.S. Armed Forces?
  - oo Addressed to members of the armed services.

No pre-planning or formal gathering of a problem solving group is necessary when a person has a problem to submit. He could simply reach out to his terminal, key in his problem statement, identify the audience he is targeting, specify a time or a number limit on responses and return to his normal activities. The next day, or the next week, or whenever he felt the need, he could check to see if there have been any responses. If there have been, he could ask to see them, in chronological order, by discipline of the responder, in alphabetical order, by keyword, or any number of orders that the computer system could arrange. Meanwhile, he might be informed that there are problem statements submitted by others that have requested his response because of his professional discipline, association membership, or because they may have been broadcast problem statements. He would be under no obligation to take the time to look at

and respond to these problem statements, but he probably would if he felt he had received some helpful responses to his own problem statement. Before he signs off he might want to take the time to notify the system that one or more of the respondents had provided exceptionally useful solutions to his problem statement. This would be accomplished through a simple "stroke" construct. The respondent would be provided a thank you note the next time he signed on and his record would be permanently updated to reflect his useful participation in the system.

The primary goal is the design of a system that is easy to use but versatile enough to be utilized in much more complicated ways if desired. The partial design proposed in this paper is intended only to suggest the broad concept and to create a starting point from which a comprehensive design may emerge (see figure 1). The concept will limit itself to a general description of the dialog syntax between the user and the system (see figure 2), the basic contents of the data base (see figure 3) and a discussion of the need to provide for potential future expansion.

3.2 Making the System Work.

Recognizing the value of an on-line problem solving system, designing it, programming it, finding a place to install it, and an organization to administer it will not automatically assure its success. The real value of such a system will be evident only when it reaches widespread and daily use. Such a system if not used extensively will rapidly approach complete disuse. If a good and useful service is provided, we should see the infamous "Turnpike Effect" take place. The "Turnpike Effect" essentially states, "Provide any useful service and the demand for that service will rise to meet the limits of the service". If we assume that the system will provide a useful service and that we will

eventually witness the turnpike effect, then we must provide for expandability in its design. This can best be achieved by considering the computer implementation of Consultant Anonymous as only one node in a network of Consultants Anonymous systems. What must be visualized are two sets of dialog: human to computer and computer to computer (see figure 1). The human to computer dialog is the only one that should be seen by humans and in effect is the face of the Consultants Anonymous system. It should be the friendly, forgiving, human engineered dialog of prompts for input, menus and distress relievers such as the Help construct. The computer to computer interface need only be recognizable by computers and need not be as friendly, but should be more concerned with efficiency. The two dialogs must work in concert transparently to the user who need only be aware of the single Consultants Anonymous node he is communicating with.

Certainly one of the main objectives of the design and implementation of Consultants Anonymous must be that the system be easier to use than to avoid. In other words, the system must be cost effective in terms of its user's personal time, and the users must be able to recognize this advantage through positive system feedback. It is important to assure people, particularly busy executives, that such a system can be more effective in many situations than conventional face-to-face and telephone communications because of its easy accessibility to large audiences.

Human beings who are the real resource in Consultants Anonymous (not the computer) will not remain satisfied for long in an anonymous and unrewarded state. They will question the value of giving good ideas to others with no recognition whatsoever. In order to satisfy this basic

human need for recognition and for receiving credit for ideas, Consultants Anonymous must contain some sort of status system. It is proposed that the subscribers to Consultants Anonymous be awarded degrees related to their experience and depth of contributions to the system. The degrees could be almost anything that reflects the status of the subscriber. Suggested are Freshman, for a new subscriber; Associate, after several contributions are made to other's problem statements; Expert, after several contributions have been recognized by the problem submitters as being worthy of special praise; and Master, when the number of recognitions has reached a considerably high level. Submitters of problem statements who desire to recognize a respondent for a particularly good contribution may do so through the utilization of the Stroke construct. The Stroke command (see figure 2) when issued will update the contributor's statistics in his subscriber data of the Subscriber Table. When sufficient strokes are received, the contributor's status and therefore his degree is elevated. Anonymity is preserved and the subscribers will continue to know one another only by academic discipline and status/degree. However, a listing of subscribers with their actual names, disciplines, and status/degrees may also be retrieved through the Directory (see figure 2) command. In this way the subscribers may receive personal recognition but remain anonymous on specific contributions.

A weekly or monthly newsletter would help a great deal and should be considered as a must in maintaining a form of cohesiveness of the diverse group of users. The newsletters could list new members, publish letters from members, show examples of good problem submittals and responses, identify and explain new system features, recognize members whose status has elevated, provide numerous statistics on the members

and the system usage, etc. A Comment construct (see figure 2) would be most useful in acquiring subscribers feelings about the operation of the system and collecting suggestions for future improvements. The administrator of the system should encourage the creation of associations and even personal meetings/conferences on occasion, since this would foster a comraderie, permit more sophisticated use and further assure successful operation of the system. One of the almost immediate enhancements of Consultants Anonymous would be the addition of a verb for creating new associations. The verb could be used by anyone desiring to form an association. Along with the verb he could provide a charter and an outline of membership requirements. Other subscribers upon logging in would be informed of the opportunity to join the association. The association creation verb also implies join, quit and disestablish verbs. Little policing of the activities of the system is recommended or should be necessary; however, the administrator must be quick to warn intentional system abusers of potential loss of system use privileges should their behavior continue. An intentional abuse might be the submission of responses with purposely offensive or foul language.

4. SUMMARY.

Alvin Toffler in his book "The Third Wave" talks about the two great waves of change that the human race has undergone; the agricultural revolution which covered thousands of years, and the rise of industrial civilization which took a mere three hundred years. He then spoke of the "Third Wave" which will complete its sweep in a few decades. This third wave is keyed upon the emergence of the computer and the enormous changes that are occuring in todays society. The ready

availability of computing power and information will transform society in ways that were only imagined in science fiction stories a few years ago. Computer system applications such as Consultants Anonymous are inevitable in this new society. It remains for human beings currently living in the "Third Wave" to plan intelligently for the utilization of the power that is becoming available to us all. We must recognize now that computer power through distributed networks of computers and terminals is going to be available to the degree that the telephone is today.

The corporations and nations that accept the inevitable fact of change, and learn to harness the information/intelligence distribution power of the computer will remain as leaders or emerge as new leaders of industry and the world in the next few decades. Systems such as Consultants Anonymous, CONFER II, and others are a mere drop in the bucket, but their time has come. With intelligent sharing of intelligence, the U.S. can maintain its technological leadership, increase its productivity and assure its economic viability in this time of rapid change. We must begin now to take advantage of the intelligence resources within the DOD and other government agencies. We must also remember that this intelligence is not restricted to but a few organizations and high grade levels but is inherent in all human beings. As the Japanese have done with their management style, we too can tap the hidden potential which is available in everyone.

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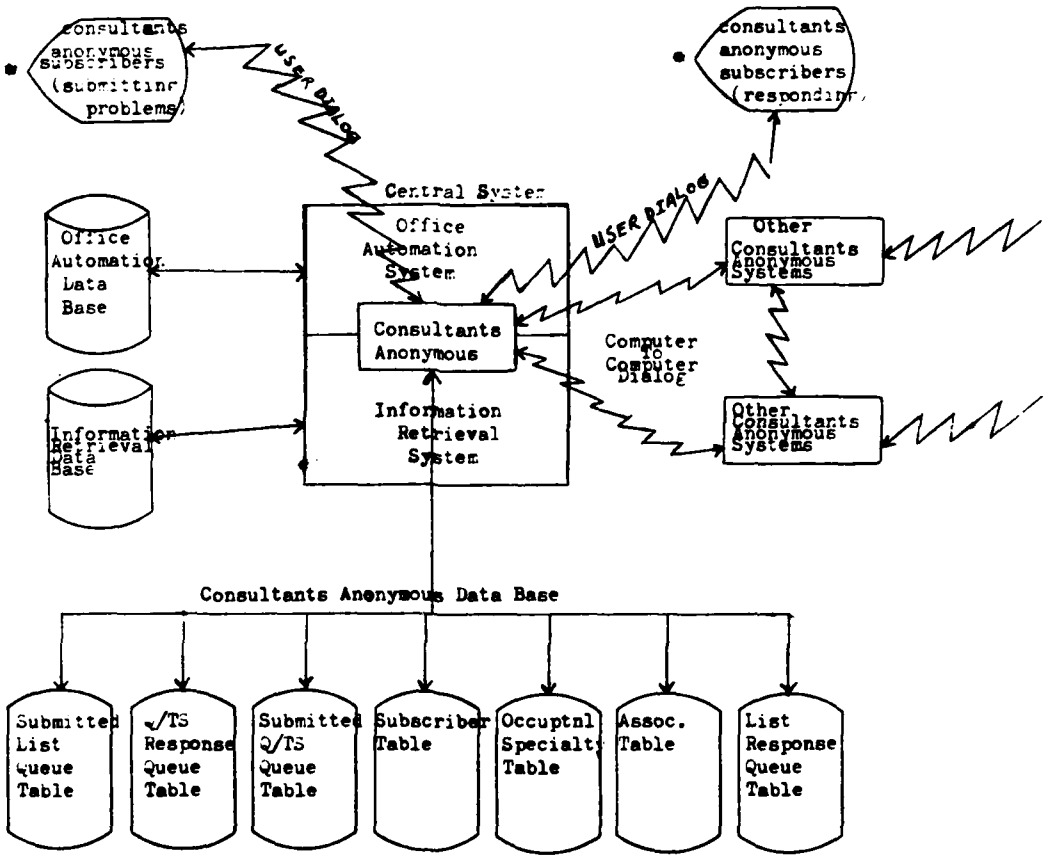
FIGURE 1

GENERAL SYSTEM STRUCTURE

OF

CONSULTANTS ANONYMOUS



* Terminals, for those who qualify, should be software switchable from consultants anonymous to the information retrieval and to the office automation system where electronic mail, word processing, bulletin boards, computer conferencing or other office automation services are available.

Figure 1
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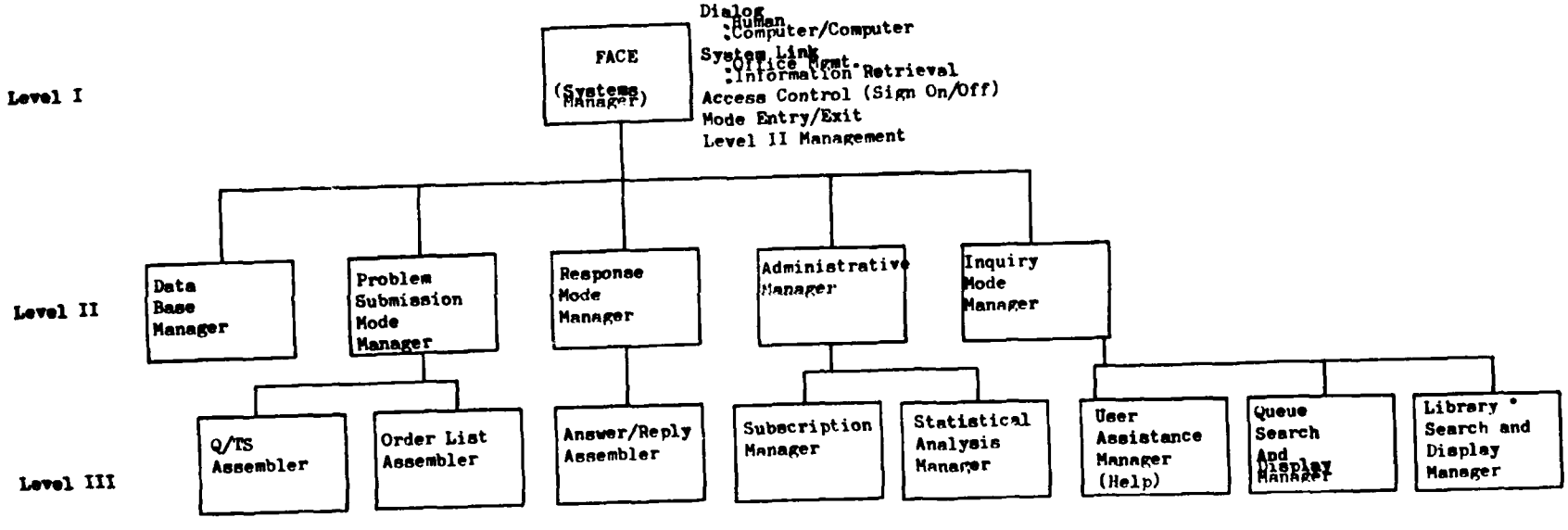
FIGURE 1

CONSULTANTS ANONYMOUS

(Internal Structure)



• Historical libraries of Q/TS and responses. (Not shown in data base)

FIGURE 1

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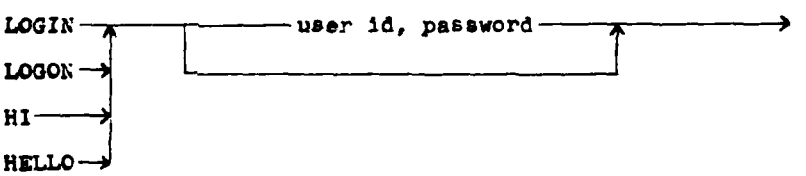
FIGURE 2

CONSULTANTS ANONYMOUS USER DIALOG SYNTAX

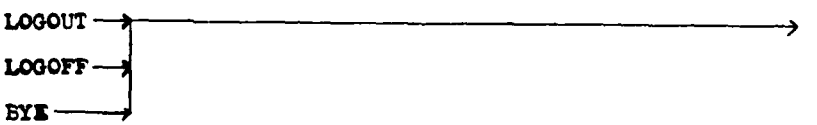
Note: The following syntax examples are provided only to suggest the general information to be exchanged by the user and the Consultants Anonymous system. The actual implementation should be in the form of computer generated prompts for information such as menus, specific requests for input data, etc. Standard railroad notation is utilized in defining the syntax, however the appearance of a comma simply would indicate that another computer prompt would be made for more information.

ACCESS CONTROL:

. Entry Verbs:



. Exit Verbs:



ASSISTANCE VERB:

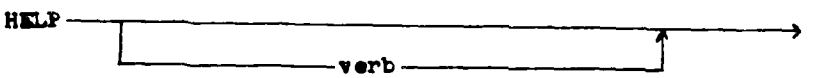


Figure 2
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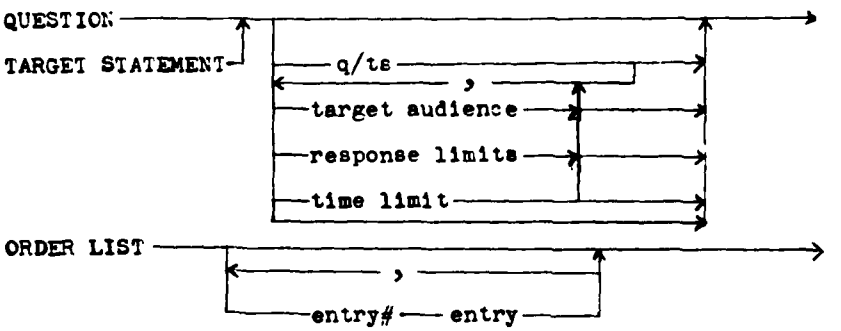
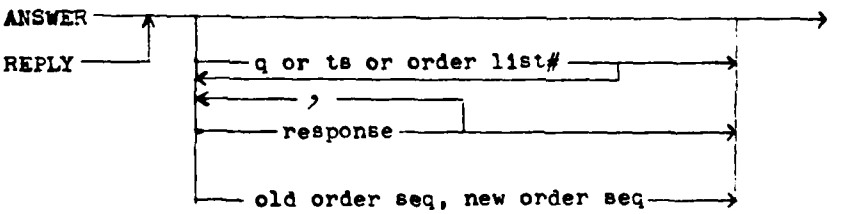
MODE ENTRY/EXIT:

. Problem Submission Mode:



. Response Mode:



. Inquiry Mode:

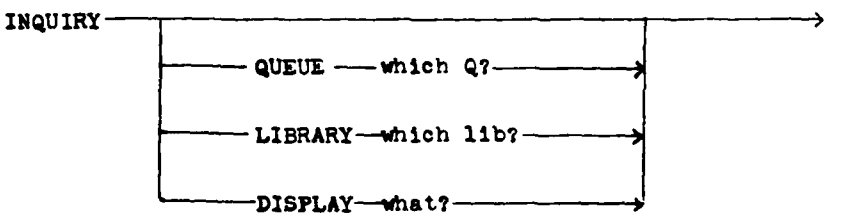


Figure 2
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MISCELLANEOUS VERBS:

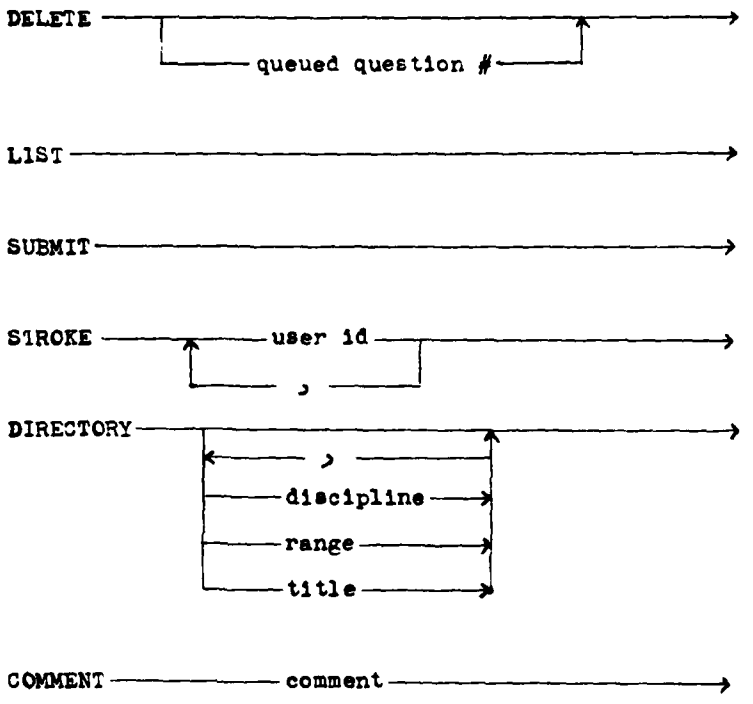

Figure 2
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USER DIALOG SYNTAX

Access Control Verbs: The Access Control Verbs would be utilized to establish initial entry or final exit from the system. The entry verbs would either be followed directly by a User Identification Code and Password or the computer system may specifically request their entry.

Assistance Verb: It is very important to implement user assistance features such as "HELP" in order to reduce the necessity of memorizing details of operation of the system, since users might use the system only infrequently. The "HELP" verb should be allowed at any time, whereby operating information is provided. Each immediately subsequent entry of the "HELP" verb should provide correspondingly more detailed information. "HELP" followed by another verb should provide detailed information on only that verb.

Mode Entry/Exit Verbs: The mode entry verbs permit the user to enter on of three modes:

- o Problem Submission: Will allow the

Figure 2
Page 4 of 6

single or repetitive submission of questions, target statements or lists to be later responded to by other users.

- o Response: Will permit a user to provide responses to queued questions, target statements, or lists.
- o Inquiry: Will permit the user to view a directory of queues of current or the libraries of past questions, target statements or lists. Further delineations of the queues and libraries are;

  MY-Only those submitted by himself.

  ALL-Those submitted by all users.

  DISCIPLINE-Those submitted by users registered under a specific discipline.

  KEYWORD-Those matching specified key-words.

The "EXIT" verb will cause an exit from one of the above modes to allow log-off or movement to another system to take place.

Miscellaneous Verbs: Some allowable verbs that provide miscellaneous utility functions would be:

- o Delete: Will allow a user to delete a previously submitted question target statement or list.
- o List: This function would provide a display to the user terminal of the current question, target statement, list or response that he is preparing.
- o Submit: This function would cause the submission of the currently prepared question, target statement, list or response to the system.
- o Stroke: Will provide a means of giving credit to an anonymous contributor of a response.
- o Directory: Will provide a list of system subscribers, by discipline, range of names, or status title.
- o Comment: Will allow a current user to submit free form comments for use by the administrator of the system.

Figure 2
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FIGURE 3

CONSULTANTS ANONYMOUS DATA BASE

The Consultants Anonymous data base to be maintained on the central computer resource must contain data on the subscribers, occupational specialties, associations, currently submitted questions, target statements, lists, responses and historical data on the same. Figure 3 illustrates the basic data content in a psuedo relational database form. The data content presented is not intended to be total but representative of the type data required. Several tables (data sets) are suggested:

Subscriber Table: This table would contain basic information about the subscriber, such as his account code, password, and a response anonymity code which would allow for specification of varying degrees of anonymity as the subscriber desires. It would also contain numerous statistics concerning his activities both as a submitter and as a responder in the system. The number of occupational specialties and associations with which he is associated would also be recorded. Since the occupational Specialty

Figure 3
Page 1 of 6

and Association Tables contain the account codes of its members, there is no logical need to maintain the actual occupational specialty or association name within the Subscriber Table. Direct relationship between the three tables discussed is maintained through the account code. Indirect relationships are maintained by the number of occupational specialities and number of associations data elements in the subscriber table. These data elements must be utilized to confirm that all appropriate entries in the Occupational Specialty and Association Tables have been located.

Occupational Specialty Table: This table would contain an entry for each occupational specialty or professional discipline. Each entry in turn would provide basic information on that specialty, such as the specialty code, specialty name and the account numbers that are recorded under the specialty. The account codes provide direct relational indexes to the Subscriber Table.

Association Table: This table would contain an entry for each officially sanctioned association. Each entry in turn provides basic

information on that association such as the association codes, association name and the account codes that are recorded under the association. The account codes provide direct relational indexes to the Subscriber Table.

Submitted Question/Target Statement (Q/TS) Queue Table: This table is designed to contain the currently outstanding questions and target statements. It identifies the submitter (by account code) and the targeted audiences by occupational specialties or association codes. The account code provides a direct relational index to the subscriber table.

Submitted List Queue Table: This table is essentially dentical to the Q/TS table with the exception that it contains lists rather than Q/TS.

Q/TS Response Queue Table: This table is intended to contain the responses to a submitted Q/TS. It provides direct relational indexes to the submitted Q/TS and the Subscriber Tables, thus allowing identification of both submitter and responder.

Figure 3
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List Response Queue Table: This table is essentially the same as the Q/TS Response Table except that it contains responses to submitted lists in the form of new sequence numbers or added elements for the submitted lists.

Figure 3
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CONSULTANTS ANONYMOUS DATA BASE

SUBSCRIBER TABLE

```
 Ø1 # of Subscribers
*Ø1 Subscriber Data (Occurs once for each subscriber)
    Ø5 Account Code
    Ø5 Password
    Ø5 Response Anonymity Code
    Ø5 Statistics
       1Ø # of current target statements or questions submitted
       1Ø # of current lists submitted
       1Ø Total target statements or questions submitted
       1Ø Total lists submitted
       1Ø Date of last response to other subscribers
       1Ø Total responses to other subscribers
       1Ø Total strokes received
    Ø5 # of Occupational Specialties (Academic Disciplines)
    Ø5 # of Associations
```

OCCUPATIONAL SPECIALTY TABLE

```
 Ø1 # of Occupational Specialties (Academic Disciplines)
*Ø1 Occupational Specialty Data (occurs once for each specialty)
    Ø5 Occupational Specialty Code
    Ø5 Occupational Specialty Name
    Ø5 # of Account Codes in this Specialty
   *Ø5 Account Code (Occurs once for each person on this Spec.)
```

ASSOCIATION TABLE

```
 Ø1 # of Associations
*Ø1 Association Data (Occurs once for each Association)
    Ø5 Association Code
    Ø5 Association Name
    Ø5 # of Account Codes in this Association
   *Ø5 Account Code (Occurs once for each person in this Assoc.)
```

Note:
*Indicates that the element will occur multiple times within the table.

Figure 3
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SUBMITTED QUESTIONS/TARGET STATEMENT (Q/TS) QUEUE TABLE

```
 Ø1 # of Q/TSs in Table
*Ø1 Q/TS Data (Occurs once for each Q/Ts in table)
    Ø5 Account Code (of Submitter)
    Ø5 Q/TS # (# of the Q/TS within level Ø1)
    Ø5 Related Q/TS # (Identifies previous Q/TS in string)
    Ø5 Q/TS String Data
         Value=Numeric ØØ-99 (99=last Q/TS in string)
    Ø5 Q/TS (Contains actual Q/TS)
    Ø5 # of Targeted Audiences (99=Broadcast)
   *Ø5 Target Occupational Specialty OR Association Code
         (Occurs once for each)
```

SUBMITTED LIST QUEUE TABLE

```
 Ø1 # of Lists in Table
*Ø1 List Data (Occurs once for each list in table)
    Ø5 Account Code (of Submitter)
    Ø5 List # (# of the list within level Ø1)
    Ø5 Related List Element # (Identifies previous list element
         in string)
    Ø5 List String Data
         Value=ØØ-99 (99=last list element in string)
    Ø5 List element (Contains actual list element)
    Ø5 # of Targeted Audiences (99=Broadcast)
   *Ø5 Target Occupational Specialty or Association Code
         (Occurs once for each)
```

Q/TS RESPONSE QUEUE TABLE

```
 Ø1 # of Q/TS Responses in Table
*Ø1 Q/TS Response Data
    Ø5 Related Q/TS #
    Ø5 Q/TS Responder Account Code
    Ø5 Q/TS Response
```

LIST RESPONSE QUEUE TABLE

```
 Ø1 # of List Responses in Table
*Ø1 List Response Data
    Ø5 Related List #
    Ø5 List Responder Code
    Ø5 Old List Element #s
    Ø5 Recommended New Position #s in List
    Ø5 Recommended New Element and Position #s in List
```

Note: *indicates that the element will occur multiple times within the table.

Figure 3
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FIGURE 4

7

THE IDEA FUNNEL